GLOSSARY

(Italicized words are defined in glossary.)

11e(2) byproduct material. The tailings or *waste* produced by the extraction or concentration of *uranium* or *thorium* from any ore processed primarily for its *source material* (i.e., uranium or thorium) content. 11e(2) byproduct material is defined in Section 11e(2) of the *Atomic Energy Act*, as amended.

Accelerator produced. Any material made *radioactive* by the normal operation of a particle accelerator.

Activity. Short for *radioactivity*.

Activated. Describes non-*fissile* material that has become *radioactive* as a result of *neutron irradiation*.

Alpha particle. A particle consisting of two protons and two *neutrons*, given off by the decay of many elements, including *uranium*, *plutonium*, and *radon*. Alpha particles cannot penetrate a sheet of paper; however, alpha-emitting *isotopes* in the body can be very damaging.

Atmospheric fallout. *Radioactive* particles resulting from a nuclear explosion that gradually descend to earth.

Atmospheric testing. The aboveground or underwater explosion of a nuclear device in order to test it or its effects.

Atom. The basic component of all matter. The atom is the smallest particle of an element that has all of the chemical properties of that element. Atoms consist of a *nucleus* of protons and *neutrons* surrounded by electrons.

Atomic Energy Act. The federal law that administers and regulates the production and uses of atomic power. The act was passed in 1946 and amended substantially in 1954 and several times since then.

Atomic Energy Commission (AEC). AEC was created by the *Atomic Energy Act* in 1947 as the civilian agency responsible for the production of nuclear weapons. AEC also researched and regulated atomic energy. Its weapons production and research activities were transferred to the *Energy Research and Development Administration* in 1975, while its regulatory authority was transferred to the new *Nuclear Regulatory Commission*.

Beryllium. The forth-lightest element. Some nuclear weapon parts are made of beryllium.

Byproduct Material. Any *radioactive* material (except *special nuclear material*) yielded in or made radioactive by exposure to the *radiation* incident to the process of producing or utilizing special nuclear material, and the tailings or *waste* produced by the extraction or concentration of *uranium* or *thorium* from any ore processed primarily for its *source material* content.

Beta particle. A particle emitted in the *radioactive* decay of many *radionuclides*. A beta particle is identical to an *electron*. It has a short range in air and a low ability to penetrate other materials.

Calcine. A process that uses heat to convert liquid *high-level waste* into a dry, powdery form. Also the powdered *waste* that results from this process.

Canyon. A vernacular term for a *chemical separations* plant, inspired by the plant's long, high, narrow structure. Not all chemical separations plants are canyons.

Cesium. An element chemically similar to sodium and potassium. *Isotope* cesium-137 is one of the most important *fission* products, with a *half-life* of about 30 years.

Chemical separation. A process for extracting *uranium*, *plutonium*, and other *radionuclides* from dissolved *spent nuclear fuel* and *irradiated targets*. The *fission* products that are left behind are *high-level waste*. Chemical separation is also known as *reprocessing*.

Cladding. The outer layer of metal over the *fissile* material of a nuclear fuel element. Cladding on DOE's *spent nuclear fuel* is usually aluminum or zirconium.

Co-extrusion. A process used to *clad* nuclear fuel elements for Hanford *N Reactor* and the Savannah River Site reactors. A press extrudes *uranium* billets welded inside aluminum or zirconium *cladding* material into tubes, bonding the *uranium* to the cladding materials.

Co-product. Hanford site code name for *tritium*.

Cold War. A conflict over ideological differences between the United States and the Soviet Union and their allies lasting from the late 1940s until the early 1990s

and carried on by methods short of sustained military action.

COLEX (Column Exchange). Acronym for the column exchange process that was used at the Y-12 Plant to enrich *lithium*. COLEX was the principal lithium *enrichment* process used at the Y-12 Plant.

Commercial power reactor. Privately-owned *nuclear reactors* used to produce electricity. Commercial power reactors are fueled with *low-enriched uranium*.

Component fabrication. Includes the manufacturing, assembly, inspection, bench testing, and verification of specialized nuclear and non-nuclear parts and major subassemblies. Chemical processing to recover, purify, and recycle *plutonium*, *uranium*, *tritium*, and *lithium* from retired warheads and from component fabrication scrap and residues is included in this category.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). (42 USC 9601 et seq). A Federal law, enacted in 1980 and amended in 1986, that governs the cleanup of hazardous, toxic, and *radioactive* substances. The Act and its amendments created a trust fund, commonly known as Superfund, to finance the investigation and cleanup of releases of hazardous substances. The 1986 amendments included provisions that require *DOE* and other federal agencies to clean up their facilities under Federal Facility agreements with *EPA*.

Contaminated environmental media. Naturally occurring materials such as soil, sediment, surface water, groundwater, and other in-place materials (e.g., sludge and rubble/debris that have been disposed of and/or intermixed with soil) that are contaminated at levels requiring further assessment to determine whether an environmental restoration action is warranted.

Criticality. A term describing the conditions necessary for a sustained nuclear chain reaction.

Curie. The amount of *radioactivity* in 1 gram of the *isotope* radium-226. One curie is 37 billion *radioactive* disintegrations per second.

Daughter products. *Radionuclides* that are produced from other radionuclides when they decay.

Deactivation. Activities that ensure *surplus facilities* are secure in a safe and stable condition pending their ultimate *disposition*. Includes eliminating immediate safety and environmental hazards as well as removing most contaminants within the facility.

Decommissioning. Retirement of a nuclear facility, including *decontamination* and/or dismantlement.

Decontamination. Removal of unwanted *radioactive* or *hazardous* contamination by a chemical or mechanical process.

Department of Energy (DOE). The cabinet-level U.S. Government agency responsible for nuclear weapons production and energy research and the cleanup of *hazardous* and *radioactive* waste at its sites. It succeeded the *Energy Research and Development Administration* and other federal government entities in 1977.

Depleted uranium. *Uranium* that, through the process of *enrichment*, has been stripped of most of the *uranium-235* it once contained, so that it has more *uranium-238* than *natural uranium*. It is used in some parts of nuclear weapons and as a raw material for *plutonium* production.

Detection level. The level above which a constituent (e.g., metal, organic) can be detected in a medium through sampling and analysis.

Deuterium. A naturally occurring *isotope* of hydrogen. Deuterium is lighter than *tritium*, but twice as heavy as ordinary hydrogen. Deuterium is most often found in the form of *heavy water*.

Disposition. Reuse, recycling, sale, transfer, storage, treatment, or disposal.

Dose. A specific amount of ionizing *radiation* or a toxic substance absorbed by a living being.

Easement. A right or privilege that a person may have in another's land.

Electromagnetic spectrograph. Process used to *enrich uranium* based on the tendency of ions of the *uranium-238* to deflect at a lower rate than *ions* of *uranium-235* as they travel through a magnetic field. This process was used in a device called a "Calutron" and was used at the Y-12 Plant from late 1943 through 1946.

ELEX (Electric Exchange). Acronym for the electric exchange process that was used at the Y-12 Plant to *enrich lithium*.

Energy Policy Act of 1992. (Public Law 102-486). Emphasizes energy efficiency, research and develop-

ment on conventional fuels, alternative fuels, and *uranium enrichment*. Also establishes several guidelines for *radioactive waste* disposal.

Energy Research and Development Administration (ERDA). The agency created in 1975 to take over the weapons production and research responsibilities of the *Atomic Energy Commission*. ERDA was abolished in 1977, and its functions, along with other federal government functions, were transferred into the cabinet-level *DOE* in 1977.

Enrichment. See *isotope separation*.

Entombment. An alternative for dispositioning *surplus facilities* by burial or covering in a vault.

Environmental contamination. The release into the environment of *radioactive*, *hazardous* and toxic materials.

Environmental Protection Agency (EPA). A Federal agency, established in 1970, responsible for enforcing environmental laws including the *Resource Conservation and Recovery Act* (RCRA); the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA); and the *Toxic Substances Control Act* (TSCA).

Experimental breeder reactor. Experimental breeder reactors are located at Hanford, Washington and Idaho National Engineering Laboratory, Idaho. A breeding reactor produces more *fissile* material than it consumes.

Fat Man. The second atomic bomb used in combat by the United States. Fat Man was dropped on Nagasaki, Japan, on August 9, 1945.

Federal Facility Compliance Act (Public Law 102-386). A 1992 amendment to *RCRA*, this law made Federally owned and operated facilities subject to state-imposed fines and penalties for violations of *hazardous waste* requirements and required *DOE* to develop plans for treatment of *RCRA*-regulated *mixed waste*.

Fissile. Capable of being split by a low-energy *neutron*. The most common *fissile isotopes* are *uranium*-235 and *plutonium*-239.

Fission. The splitting or breaking apart of the *nucleus* of a heavy *atom* usually caused by the absorption of a *neutron*. Large amounts of energy and one or more neutrons are released when an atom fissions.

Formerly Utilized Sites Remedial Action Project (FUSRAP). A *DOE*-managed program to clean up privately owned facilities that were contaminated as a result of past nuclear materials research and production. Many of these facilities were part of the *Manhattan Project*.

Fuel, nuclear. Natural or enriched *uranium* that sustains the *fission* chain reaction in a *nuclear reactor*. Also refers to the entire fuel element, including structural materials and *cladding*. Also known as *reactor fuel*.

Fuel and target fabrication. Consists of the foundry and machine shop operations required to convert *uranium* feed material, principally metal, into *nuclear fuel* and *target* elements used in nuclear materials *production reactors*.

Fuel-grade plutonium. *Plutonium* that contains more than 7% plutonium-240 *isotope* by mass.

Fusion. The process whereby the *nuclei* of lighter elements, especially the *isotopes* of hydrogen (*deuterium* and *tritium*) combine to form the *nucleus* of a heavier element with the release of substantial amounts of energy.

Gamma radiation. High-energy, highly penetrating electromagnetic *radiation* emitted in the *radioactive* decay of many *radionuclides*. Gamma rays are similar to X-rays.

Gas centrifuge. A *uranium enrichment* process using a large number of rotating cylinders in a series. The lighter *uranium-235* isotope concentrates at the center of a spinning centrifuge of gaseous *uranium hexafluoride*. This method produced the first gram quantities of enriched uranium in 1944.

Gaseous diffusion. A *uranium enrichment* process based on the difference in rates at which uranium *isotopes* in the form of gaseous *uranium hexafluoride* diffuse through a porous barrier. This process is used to enrich uranium in the United States. The full scale K-25 gaseous diffusion plant was completed and operational at Oak Ridge, Tennessee in August 1945. Two additional, currently operating, gaseous diffusion plants previously used by *AEC* and *DOE* for weapons production are located at Paducah, Kentucky and Piketon, Ohio.

Geologic repository. A place to dispose of *radioactive waste* deep beneath the earth's surface.

Graphite reactor. A *nuclear reactor* using graphite blocks surrounding the nuclear fuel to slow the neutrons to low energy so that a self-sustaining chain reaction is achieved. The first nuclear reactors built near Chicago, Illinois; Oak Ridge, Tennessee; and Hanford, Washington were graphite reactors.

Half-life. The time it takes for one-half of any given number of unstable *atoms* to decay. Each *isotope* has its own characteristic half-life. They range from small fractions of a second to billions of years.

Hazardous waste. Defined under *RCRA* and its implementing regulations in Title 40 of the Code of Federal Regulations, Parts 260 to 279, and corresponding state regulations. A material is a hazardous waste under RCRA if it meets the definition of a solid waste as well as certain criteria for a hazardous characteristic or "listing."

Heavy metals. Metallic elements with high atomic weights (e.g., mercury, chromium, cadmium, arsenic, and lead) that can damage living organisms at low concentrations and tend to accumulate in the food chain. *Uranium*, *thorium*, and *plutonium* are also heavy metals.

Heavy water. Water that contains *deuterium atoms* in place of hydrogen atoms. Heavy water is used in the Savannah River Site *production reactors*.

High-level waste. Highly *radioactive* material resulting from the *reprocessing* of *spent nuclear fuel*, including liquid *waste* produced directly in reprocessing and any solid material derived from such liquid waste that contains *fission* products in sufficient concentrations.

Highly-enriched uranium. *Uranium* with more than 20 percent of the *uranium-235 isotope*, used for making nuclear weapons and also as *fuel* for some *isotope*-production, research, and power reactors. *Weapons-grade uranium* is a subset of this group.

Hydrofracture. An underground injection disposal technology used in the past to dispose *radioactive* waste.

Initiator. A device that produces a timed burst of *neutrons* to initiate a *fission* chain reaction in a nuclear weapon. Initiators made of polonium-210 and *beryllium* were located at the center of the *fissile* cores of early atomic weapons.

Institutional controls. Long-term actions or restrictions including monitoring, periodic sampling, access controls, and land use restrictions designed to mitigate any risks posed by contamination following remediation. Institutional controls alone may be sufficient to reduce risks posed by low-levels of contamination.

Ion exchange resins. Synthetic material used to selectively remove dissolved contaminants such as *heavy metals* or *radionuclides* from water by replacing or exchanging them with other constituents. Resins are typically used in beads or cartridges of beads or powders through which water is pumped.

Irradiate. To expose to ionizing *radiation*, usually in a *nuclear reactor*. *Targets* are irradiated to produce *isotopes*.

Isotope separation (enrichment). The process of separating different *isotopes* of the same element. The three elements that have been isotopically *enriched* in large quantities for use in nuclear weapons production are *uranium*, *lithium*, and hydrogen.

Isotopes. Forms of the same chemical element that differ only by the number of *neutrons* in their *nucleus*. Most elements have more than one naturally occurring isotope. Many more isotopes have been produced in *nuclear reactors* and accelerators.

Lithium. The lightest metal, and the third-lightest element. Lithium has two naturally occurring *isotopes*, lithium-6 and lithium-7. Lithium-6 *targets* are *irradiated* to manufacture *tritium*.

Little Boy. The first atomic bomb used in combat by the United States. Little Boy was dropped on Hiroshima, Japan on August 6, 1945.

Long-lived radionuclide. For *waste* management purposes, a *radioactive isotope* with a *half-life* greater than approximately 30 years.

Low-enriched uranium. *Uranium* that has been enriched until it consists of about three percent *uranium-235* and 97 percent *uranium-238*. Used as nuclear *reactor fuel*.

Low-level waste. Any *radioactive waste* that is not *spent fuel*, *high-level* or *transuranic waste*, or *11e(2) byproduct material*.

Manhattan Engineer District (MED). Established in August 1942, this district of the U.S. Army Corps of Engineers was the agency authorized to oversee the design, production, and testing of the first nuclear

weapons. On January 1, 1947, the district transferred authority over nuclear weapons stewardship to the civilian authority of the newly established *Atomic Energy Commission*; the district was abolished later that year.

Manhattan Project. The U.S. Government project, named for the *Manhattan Engineer District* that produced the first nuclear weapons during World War II. Started in 1942, the Manhattan Project formally ended in 1946. The Hanford Site, the Oak Ridge Reservation, and the Los Alamos National Laboratory were created for this effort.

Materials in inventory. Materials that are not currently in use (i.e., have not been used during the last year and are not expected to be used within the coming year) and have not been designated as *waste* or set aside by the Nuclear Weapons Council for national defense purposes. For nuclear materials, 'not currently in use' is synonymous with 'inactive' per *DOE* Order 5660.1B.

Mill tailings. The sand-like materials left over from separating *uranium* from its ore. More than 99 percent of the ore becomes tailings. Mill tailings, which are one type of *11e(2) byproduct* material, typically contain about 85 percent of the *radioactivity* present in unprocessed ore.

Mixed waste. *Waste* that contains both chemically *hazardous* waste, as defined under *RCRA*, and source, *special nuclear,* or *byproduct materials* as defined under the *AEA*.

N Reactor. The ninth and last *production reactor* built at the Hanford Site. The N Reactor operated from 1963 through 1987. The code name "N" stands for "New."

National Environmental Policy Act. A Federal law, enacted in 1970, that requires the Federal government to consider the environmental impacts of, and alternatives to, major proposed actions in its decisionmaking processes.

Natural uranium. *Uranium* that has not been through the *enrichment* process. It is made of 99.3 percent *uranium-238* and 0.7 percent *uranium-235*.

Naval Nuclear Propulsion Program. A joint *DOE* and Department of Navy program responsible for activities relating to the use of nuclear power in surface warships and submarines.

Neutron. A massive, uncharged particle that comprises part of an atomic *nucleus*. *Uranium* and *plutonium atoms fission* when they absorb *neutrons*. The chain reactions that make *nuclear reactors* and weapons work thus depend on neutrons. Man-made elements can be manufactured by bombarding other elements with neutrons in *production reactors*.

Neutron Generator. Device resembling a particle accelerator that produces a timed burst of *neutrons* to initiate a *fission* chain reaction in a nuclear weapon. Neutron generators located outside the *fissile pit* supplanted *initiators*.

Nuclear Reactor. A device that sustains a controlled nuclear *fission* chain reaction.

Nuclear Regulatory Commission (NRC). An independent agency of the Federal government created by the Energy Reorganization Act of 1974, which abolished *AEC* and transferred its regulatory function to the NRC. Responsible for ensuring adequate protection of public health and safety, the common defense and security, and the environment in the use of nuclear materials in the United States. Responsible for regulation of commercial nuclear power reactors; nonpower research, test, and training reactors; fuel cycle facilities; medical, academic, and industrial uses of nuclear materials; and the transport, storage, and disposal of nuclear materials as *waste*.

Nuclear Waste Policy Act of 1982 (Public Law 97-425). The federal law that provides for the development of *geologic repositories* for disposal of *high-level waste* and *spent nuclear fuel* and establishes a program of research, development, and demonstration regarding disposal of *high-level waste* and *spent nuclear fuel*.

Nuclear weapons complex. The chain of foundries, *uranium enrichment* plants, *nuclear reactors, chemical separation* plants, factories, laboratories, assembly plants, and test sites that produces nuclear weapons.

Nucleus. The cluster of protons and *neutrons* at the center of an *atom* that determines its identity and chemical and nuclear properties.

Office of Environmental Management. An office of the *Department of Energy* that was created in 1989 to oversee the Department's waste management and environmental cleanup efforts. Originally called the *Office of Environmental Restoration and Waste Management*, it was renamed in 1993.

Office of Environmental Restoration. The Environmental Restoration program is a division of the *Office of Environmental Management*. Its overall mission is to protect human health and the environment from risks posed by inactive, *surplus facilities* and contaminated areas.

Office of Nuclear Material and Facility Stabilization. The Nuclear Material and Facility Stabilization program is a division of the *Office of Environmental Management*. Its overall mission consists of three functions: stabilizing and storing nuclear materials prior to final *disposition*, *deactivating surplus facilities*, and managing *spent nuclear fuel* treatment and storage.

Office of Waste Management. The Waste Management program is a division of the *Office of Environmental Management*. Its overall mission is to protect people and the environment from the hazards of DOE *waste* by providing an effective and efficient system that treats, stores, and disposes of stored and newly-generated wastes.

Overpack containers. Containers, such as drums, boxes, or canisters, used to hold one or more internal *waste* containers during storage, transport, or disposal. Overpacks provide structural stability and an additional layer of protection.

Pit. The central core of the *primary* stage of a nuclear weapon consisting of *fissile* materials surrounded by the tamper and sometimes by a sealed metal shell.

Plume. A subsurface zone that contains predominantly dissolved and sorbed contaminants that originate from a contaminant source area. A plume can extend for some distance, depending on groundwater flow and chemistry.

Plutonium (Pu). A man-made *fissile* element. Pure plutonium is a silvery metal heavier than lead. Material rich in the plutonium-239 *isotope* is preferred for manufacturing nuclear weapons. The *half-life* of plutonium-239 is 24,000 years.

Plutonium residues. Materials left over from the processing of *plutonium* that contain enough plutonium to make its recovery economically beneficial.

Polychlorinated biphenyl (PCB). A group of commercially produced organic chemicals used since the 1940s in industrial applications throughout the *nuclear weapons complex*. PCBs are found in many of the gaskets and large electrical transformers and capacitors in the gaseous diffusion plants. They can be toxic to humans and animals.

Primary. Provides the initial source of energy to initiate a nuclear chain reaction for a nuclear weapon. Consists of a central core, called the *pit*, surrounded by a layer of high explosive. The pit is typically composed of *plutonium-239* and/or *highly enriched uranium* surrounded by a tamper.

Process Water. Name for treated Columbia River water used as coolant in the Hanford *production reactors*.

Process Tube. Horizontal aluminum (later zirconium) tube containing *nuclear fuel* and cooling water in Hanford *production reactors*.

Production reactor. A *nuclear reactor* designed to produce man-made *isotopes*. *Tritium* and *plutonium* are made in production reactors. The United States has 14 such reactors, 9 at the Hanford Site and 5 at the Savannah River Site. All have been closed.

PUREX. An acronym for *plutonium-uranium* extraction, the name of a chemical process used to *reprocess spent nuclear fuel* and *irradiated targets*. Also refers to the *chemical separations* plant at the Hanford Site built to use this process. The PUREX Plant operated from 1957 to 1972 and from 1983 to 1988.

Radiation. Energy transferred through space or other media in the form of particles or waves. Certain radiation types are capable of breaking up *atoms* or molecules. The splitting, or decay, of unstable atoms emits ionizing radiation.

Radiation dose commitment. The total theoretical *dose* to be received by an individual or population as a result of a condition or activity, calculated by summing the annual average dose over all time until the material has decayed.

Radioactive. Of, caused by, or exhibiting *radioactivity*.

Radioactivity. The spontaneous emission of *radiation* from the *nucleus* of an *atom*. *Radionuclides* lose particles and energy through the process of radioactive decay.

Radioisotope thermoelectric generators. Devices that use *radionuclides* that produce heat as they decay to generate electricity. Radioisotope thermoelectric generators are used to supply electricity in nuclear weapons, spacecraft, and medical devices.

Radionuclide. A *radioactive* species of an *atom*. For example, *tritium* and *strontium*-90 are radionuclides of elements of hydrogen and strontium, respectively.

Radon. A *radioactive* inert gas that is formed by the decay of *radium*. Radium is, in turn, a link in the decay chain of *uranium-238*. Radon, which occurs naturally in many minerals, is a chief hazard of *uranium mill tailings*.

Reactor fuel. Synonymous with nuclear *fuel*.

Reactor operations. Includes *fuel* and *target* loading and removal, reactor maintenance, and operation of the reactor itself.

REDOX (Reduction Oxidation). One of the three *chemical separation* processes used on a large scale in the United States to chemically dissolve *spent nuclear fuel* and *irradiated targets* and isolate and concentrate the *plutonium*, *uranium*, and other nuclear materials that they contain. S Plant at Hanford, also known as the REDOX plant, operated using this process from 1951 until 1967.

Release site. A unique location at which a *hazardous*, *radioactive*, or *mixed waste* release has or is suspected to have occurred. A release site is usually associated with an area where wastes or substances contaminated with *wastes* have been disposed of, treated, stored, or used.

Reprocessing. Synonymous with *chemical separation*.

Research Conservation and Recovery Act (RCRA) (Public Law 94-580). A Federal law enacted in 1976 to address the treatment, storage, and disposal of *hazardous waste*.

Research, development, and testing (RD&T). Research and development includes the basic and applied science and technology of nuclear weapons and the engineering design of the weapons themselves. Testing includes nuclear explosions and other activities to evaluate the behavior, reliability, safety and effects of nuclear weapons. RD&T was carried out at National Laboratories, the Nevada Test Site, in the South Pacific, and at several other locations.

Research reactor. A class of *nuclear reactors* used to do research into nuclear physics, reactor materials and design, and nuclear medicine. Some research reactors also produce *isotopes* for industrial and medical use.

Residual radioactive material. Defined in Title I of *UMTRCA* as *waste*, including *mill tailings* and other forms of waste, resulting from the processing of ores for the extraction of *uranium* and other valuable constituents of the ores. This includes any residual stock of unprocessed ores or low-grade materials. *11e(2) byproduct material* managed under the *UMTRA Project* is residual *radioactive* material.

Saltcake. A cake of dry crystals of *radionuclides* found in *high-level waste* tanks.

Sanitary waste. *Waste* that does not contain *radioactive* or *hazardous* constituents sufficient to require special management. Sanitary waste includes municipal solid waste, construction/demolition debris, and some waste water.

Sealed source. A small package of *radioactive* materials used as a portable source of *radiation* packaged to minimize the possibility of dispersion of its radioactive contents.

Secondary. Provides additional explosive energy release for detonation of a nuclear weapon. Activated by the explosion from the *primary* assembly. Can be composed of *lithium* deuteride, *uranium* and other materials. Within the secondary, lithium is converted to *tritium* which undergoes *fusion* with *deuterium* to create a thermonuclear explosion.

Short-lived radioisotopes. For *waste* management purposes, *radioisotopes* with a *half-life* less than approximately 30 years.

Single pass reactors. Water-cooled *nuclear reactors* which discharge their cooling water after a single use rather than recirculating it. The first eight *production reactors* at Hanford were single pass reactors.

Source material. *Uranium* or *thorium* in any physical or chemical form, and ores containing at least 0.05 percent uranium or thorium. Source material does not include *special nuclear material* or *byproduct material*.

Special-case waste. *Waste* that is not *high-level* or *transuranic waste*, but requires greater confinement than shallow land burial.

Special nuclear material. Defined under the *Atomic Energy Act* as *plutonium*, *uranium-233*, and uranium *enriched* in the *isotopes uranium-233* or *uranium-235*. Special nuclear material does not include *source material* such as natural *uranium* or *thorium*.

Spent nuclear fuel. *Fuel* that has been withdrawn from a *nuclear reactor* following *irradiation*, the constituent elements of which have not been separated by *reprocessing*. Spent nuclear fuel also includes *uranium*/neptunium target materials, blanket assemblies, pieces of fuel, and debris.

Stabilization. Conversion of chemically active or readily dispersible matter into an inert or less harmful form. Also, activities to reduce the active management required for *surplus facilities* (such as burial ground stabilization and closure).

Strontium. An element chemically similar to calcium. *Isotope* strontium-90 has a half-life of 28 years, and is one of the most common *fission* products.

Surplus facility. A building, structure, or portion of a building or structure that *DOE* no longer needs to fulfill its mission.

Target. Material placed in a *nuclear reactor* to be bombarded with *neutrons* in order to produce *radioactive* materials. *Uranium-238* targets are used to make *plutonium*; *lithium targets* are used to make *tritium*.

Thermal diffusion. A process used to *enrich uranium* based on the faster diffusion rate of *uranium-235* than *uranium-238* in presence of a temperature difference. Employed on a production scale at the S-50 plant in Oak Ridge, Tennessee in 1945.

Thermonuclear weapon. A nuclear weapon that uses *fission* to start a *fusion* reaction. Commonly called hydrogen bomb or "H-bomb".

Thorium. A naturally occurring *radioactive* element.

Toxic Substances Control Act (TSCA). (Public Law 94-469.) A Federal law, enacted in 1976 to protect human health and the environment from unreasonable risk caused by exposure to or the manufacturing, distribution, use, or disposal of substances containing toxic chemicals. *PCBs* are regulated under TSCA.

Transuranic elements. All elements beyond *uranium* on the periodic table, including *neptunium, plutonium, americium,* and *curium*. All transuranic elements are man-made.

Transuranic waste. *Waste* contaminated with *uranium*-233 or *transuranic elements* having *half-lives* of over 20 years in concentrations more than 1 ten-millionth of a *curie* per gram of waste.

Treatability group. A grouping of *waste* on the basis of its radiological, chemical, and physical characteristics, content, and form. Used to group waste for future management activities.

Tritium. The heaviest *isotope* of the element hydrogen. Tritium is produced in *nuclear reactors* and is three times heavier than ordinary hydrogen. Tritium gas is used to boost the explosive power of most modern nuclear weapons. Tritium has a *half-life* of approximately 12 years.

Triple Dip. First process used to *clad reactor fuel* at Hanford. Process involves successive baths of molten bronze, tin, and aluminum-silicon mixture.

TRUPAC. Contact-handled *transuranic waste* will be shipped to the Waste Isolation Pilot Plant via trucks in Transuranic Packaging Transporters (TRUPACTs), containers designed to hold 14 55-gallon drums.

Underground testing. Testing of a nuclear device or its effects by exploding it underground.

Uranium. The basic material for nuclear technology. This element is naturally slightly *radioactive* and can be refined to a *heavy metal* more dense than lead.

Uranium hexafluoride. A gaseous form of *uranium* used in the *gaseous diffusion enrichment* process.

Uranium mill. A plant where *uranium* is separated from ore taken from mines.

Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978. (Public Law 95-604.) The act that directed the *Department of Energy* to provide for *stabilization* and control of the *uranium mill tailings* from inactive sites is a safe and environmentally sound manner to minimize *radiation* health hazards to the public. It authorized the Department to undertake remedial actions at 24 designated inactive *uranium*-processing sites and at an estimated 5,000 *vicinity properties*.

Uranium Mill Tailings Remedial Action (UMTRA) Project. A program to reduce the hazards posed to the public by *uranium mill tailings*. The program was created by *Department of Energy* in response to UMTRCA, which was enacted in 1978. The Department of Energy's *Office of Environmental Management* is responsible for implementing the UMTRA Project.

Uranium mining, milling, and refining. Mining and milling involves extracting *uranium* ore from the earth's crust and chemically milling (processing) it to

prepare uranium concentrate (U_3O_8), sometimes called uranium octaoxide or "*yellowcake*". Uranium concentrate is refined, or chemically converted, to purify it into the form suitable as feed material suitable for further use.

Uranium-233. A man-made *fissile isotope* of *uranium*.

Uranium-235. The lighter of the two isotopes of *uranium*; it is the only naturally occurring *fissile* element. Uranium-235 makes up 0.7 percent of the uranium that is mined from the ground. It has a *half-life* of 704 million years.

Uranium-238. The heavier of the two main *isotopes* of *uranium*. Uranium-238 makes up over 99 percent of uranium that is mined from the ground. It has a *half-life* of 4.5 billion years and is not easily split by *neutrons*.

Vicinity properties. Locations away from inactive mill sites where *uranium mill tailings* were used for construction or were transported by wind or water erosion.

Vitrification. A process that *stabilizes* nuclear *waste* by mixing it with molten glass. The glass mixture is poured into cylindrical metal canisters, where it hardens. Plants for vitrifying *high-level waste* have been built in the United States at West Valley, New York, and the Savannah River Site, South Carolina.

Waste. Includes *high-level, transuranic, low-level, mixed low-level* and *11e(2) byproduct material*.

Weapons-grade plutonium. *Plutonium* that contains at least 93% *plutonium*-239 *isotope* by mass.

Weapons-grade uranium. *Uranium* made up of over 90 percent of the *fissile uranium-235 isotope*.

Weapons operations. Includes the assembly, modification, maintenance, and dismantlement of nuclear weapons. Assembly is the final process of joining together separately manufactured components and major parts into complete, functional, and certified nuclear weapon warheads for delivery to the Department of Defense.

Yellowcake. A common *uranium* compound, U_3O_8, named for its typical color. Uranium is sent from the *uranium mill* to the refinery in this form.